AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE	OF	PAGES
	1		3

2. AMENDMENT/MODIFICAITON NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicble)
0002	6 Sep 2000		

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than Item 6)	CODE
U.S. ARMY ENGINEER DISTRICT, FTW P.O. BOX 17300 819 TAYLOR STREET FORT WORTH, TEXAS 76102-0300	DACA63	Same As Block 6	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)	(X)	9A. AMENDMENT OF SOLICIATION NO.
		DACA63-00-B-0034
		9B. DATED (SEE ITEM 11) 15 August 2000
		10A. MODIFICATION OF CONTRACT/ORDER NO.
		10B. DATED (SEE ITEM 11)
CODE / FACILITY CODE		

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

[X] The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers [ ] is extended, [X] is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a)By completing items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment your desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPIRATION DATA (If required)

13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

CHECK ONE	
	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor [ ] is not, [ ] is required to sign this document and return ———— copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

The Solicitation for Maintenance/Repair for Upgrade of Existing Railroad, Fort Polk, LA is amended as follows:

See Continuation Sheet.

NOTE: The Bid Opening date and time remains "14 September 2000, at 2:00 p.m., local time, as previously announced.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)	
15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA (Signature of Contracting Officer)	16C. DATE SIGNED

Item 14. Continued.

CHANGES TO THE SPECIFICATIONS, VOLUME I (PROJECT 1 MAINTENANCE/REPAIR FOR UPGRADE OF EXISTING RAILROAD)

1. Section 01420, BASIC STORM WATER POLLUTION PREVENTION PLAN.- Replace page 10, OWNER CERTIFICATION, with the accompanying new page 10, OWNER CERTIFICATION (signed)(1 page) and the Louisiana Notice of Intent (NOI)(2 pages).

2. Replacement Sections.- Replace the following Volume I sections with the accompanying new sections, each page bearing the notation "ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-00-B-0034":

01770 CONTRACT CLOSEOUT
16000 HIGHWAY-RAIL GRADE CROSSING WARNING SYSTEMS

CHANGES TO THE SPECIFICATIONS, VOLUME II (PROJECT 2 ROAD EXTENSION AND GRADE CROSSING)

3. Delete Sections.- Delete the following sections from Volume II:

02220 DEMOLITION
02300 EARTHWORK
02315 EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS
02316 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS
02741 HOT-MIX ASPHALT (HMA) FOR ROADS
02748 BITUMINOUS TACK AND PRIME COATS
02763 PAVEMENT MARKINGS
02933 ESTABLISHMENT OF TURF
02940 MULCHING FOR EROSION CONTROL
03100 STRUCTURAL CONCRETE FORMWORK
03150 EXPANSION JOINTS, CONTRACTION JOINTS, AND WATERSTOPS
03200 CONCRETE REINFORCEMENT
03300 CAST-IN-PLACE STRUCTURAL CONCRETE
05650 RAILROADS

4. Replacement Sections.- Replace the following Volume II section with the accompanying new section bearing the notation "ACCOMPANYING AMENDMENT NO. 0002 TO SOLICITATION NO. DACA63-00-B-0034":

02760 FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS

CHANGES TO THE DRAWINGS

5. Sequence 2 (Sheet G-2), Index of Drawings.- Delete Sequence 61, Sheet C-50 PAVING DETAILS II from the Index.

6. Table: Revise the following drawings in accordance with the following table:

Sequence No./ Sheet Number	**Change / Revision**
91 / E1 of 40	Revise Note 4 to read: **"Meter, Riser and Weather Head to be furnished and installed by the Contractor."**
92 / E2 of 40	Revise Note 3 to read: **"Meter, Riser and Weather Head to be furnished and installed by the Contractor."**
93 / E3 of 40	Revise Note 3 to read: **"Meter, Riser and Weather Head to be furnished and installed by the Contractor."**
105 / E15 of 40	Revise Note 3 to read: **"Meter, Riser, Transformer and Weather Head to be furnished and installed by the Contractor."**
106 / E16 of 40	Revise Note 4 to read: **"Meter, Riser Transformer and Weather Head to be furnished and installed by the Contractor."** Revise Note 5 to read: **"Not Applicable."**

7. Delete Sheet.- Delete the following sheet:

Seq 61 C50 PAVING DETAILS II

8. Replacement Drawings.- Replace the following drawings with the accompanying new drawings bearing the notation "AM#0002":

Seq 38 C27 GRADING AND DRAINAGE PLAN JEAN CHAPPEL ROAD
Seq 55 C44 LAYOUT PLAN OVERALL
Seq 56 C45 LAYOUT PLAN 3
Seq 57 C46 ACCESS ROAD PLAN AND PROFILE
Seq 58 C47 GRADING PLAN 3
Seq 59 C48 JOINT PLAN 3
Seq 60 C49 PAVING DETAILS I
Seq 62 C51 STORM DETAILS I
Seq 63 C52 RAILROAD CROSSING SIGN, SIGNALS, MARKINGS
Seq 64 C53 GRADE CROSSING DETAIL

END OF AMENDMENT

PART 12 ATTACHMENTS

12.1 OWNER CERTIFICATION

OWNER CERTIFICATION
FOR
(RAILROAD MAINTENANCE, UPGRADE & REPAIR PROJECT, FORT POLK, LOUISIANA))

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

NAME: Michael Mocek
TITLE: Deputy District Engineer

Date Certified: 8/31/00

Attachments:

Sheet No.	Title
(NONE)	Inspection and Maintenance Report Forms
(NONE)	Project Location Map
C-54	Temporary Erosion and Sediment Control Plan
C-55	Temporary Erosion and Sediment Control Plan
C-56	Temporary Erosion and Sediment Control Plan
C-57	Temporary Erosion and Sediment Control Plan
C-61	Temporary Erosion and Sediment Control Details

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Permits Division
Post Office Box 82135
Baton Rouge, Louisiana 70884-2135
PHONE#: (225) 765-2965 FAX#: (225) 765-0635

LPDES NOTICE OF INTENT (NOI) TO DISCHARGE STORMWATER ASSOCIATED WITH CONSTRUCTION ACTIVITY

Submission of this Notice of Intent constitutes notice that the party identified in Section I of this form intends to be authorized by an LPDES permit issued for stormwater discharges associated with construction activity in Louisiana. Submission of this Notice of Intent also constitutes that implementation of the Storm Water Pollution Prevention Plan required under the general permit will begin at the time the permittee commences work on the construction project identified in Section II below.

SECTION I
FACILITY OWNER/OPERATOR INFORMATION
(PLEASE TYPE OR PRINT CLEARLY)

Name: U.S. Army Corps of Engineers

Address: 819 Taylor Street, P.O. Box 17300

City: Fort Worth

State: Texas Zip Code: 76102-0300

Phone: 817-978-5068

Status of Owner/Operator F (F= Federal; S= State; M=Public (other than federal or state); P= private)

SECTION II
SITE INFORMATION

Name of the Project: Repair/upgrade of Existing Railroad

Location of Project: Fort Polk Military Base

City: Leesville, State: Louisiana Zip Code: 71459

Latitude: 31 03 00 Longitude: 93 13 00 Parish: Vernon

Is the facility located on Indian Lands? ____ Yes X No

Has the Stormwater Pollution Prevention Plan (PPP) been prepared? X Yes __ No

Indicate address of location of SWPPP if different from Project Location.

SWPPP Address _____

City: _____ State: _____ Zip Code: _____

Name of Receiving Water: Bundick Creek

Estimated Construction Start Date: (mo/day/yr) Oct/1/2000

Estimated Completion Date: (mo/day/yr) Aug/31/2001

Estimate of area to be disturbed (to nearest acre): 6

Estimate of Likelihood of Discharge: (choose only one):

___ Unlikely ____ Once per month X Once per week ___Once per day ___ Continual

---

Based on the attached list of endangered or threatened species are there any listed in the project area? _____ Yes X No

---

List existing or prior Water Discharge Permits for the location none

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print Name: Michael Mocek Date: 21 Aug 2000

Signature: Michael Mocek

SECTION 01770

CONTRACT CLOSEOUT
02/2000
AMENDMENT NO. 0002

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

MILITARY SPECIFICATIONS (MIL)

MIL-M-9868E	Microfilming of Engineering Data, 35mm, Requirements For

TRI-SERVICE CADD/GIS TECHNOLOGY CENTER (TSC)

TSC-01	A/E/C CADD Standard Manual (Current Release as of Contract Award date)

U.S. ARMY CORPS OF ENGINEERS (COE)

COE-02	ARCHITECTURAL AND ENGINEERING INSTRUCTIONS MANUAL (SWD-AEIM), Southwestern Division (Current issue as of Contract Award date)

1.2 PAYMENT

Contract closeout activities such as, but not limited to, operation and maintenance manuals, record drawings, warranty requirements, equipment warranty identification tags, and inventories, payrolls, and shop drawing submittals, are subsidiary activities of the contract work; separate payment will not be made for any activity unless otherwise specified. Final contract payment will not be made until completion and approval of all contract closeout activities.

1.3 OPERATION AND MAINTENANCE MANUALS

The Contractor shall be responsible for the preparation, coordination, execution and submittal of all operation and maintenance manuals (O & M Manuals), including spare parts lists, special tools, inventories of equipment manuals and maintenance instructions, and shall conduct all training for operating and service personnel. Operation and maintenance manuals shall cover all system installations provided in this contract and shall be in sufficient detail to facilitate normal maintenance and troubleshooting by persons with minimum experience with the installed equipment.

1.3.1 Submittal Requirements

All of the above listed items required in the technical specifications shall be submitted to the Contracting Officer not less than 90 days prior to the scheduled contract completion date . Fully developed and approved operation and maintenance manuals shall be provided 30 days prior to scheduling training for operating and service personnel. The Contractor shall coordinate the content of each instruction period required in the technical specifications with the Contracting Officer's Representative prior to the actual start of the training period.

1.3.1.1 Video taping of Training for Operating and Service Personnel

Each instruction or training period as discussed above, shall be video taped in VHS FORMAT by the Contractor. The taping shall include the entire session(s). The original video tape(s) shall be labeled and turned over to the Contracting Officer. The video camera and tapes utilized by the Contractor, shall be of a quality to enable clear and understandable playbacks of the recorded events.

1.3.1.2 Draft O & M Manuals

On those systems where complete and comprehensive operation and maintenance manuals cannot be fully developed until the system(s) is checked, tested, and/or balanced, and the checking, testing, and/or balancing has not been done when submittals are required, a proposed draft of those system manual(s) shall be submitted. 10 percent of the each subsequent scheduled progress payment will be retained until the complete O & M Manuals submittal package have been submitted and approved. Submit fully developed O & M Manuals of the drafts for approval after the systems have been checked, tested, and/or balanced.

1.3.1.3 Commencement of Warranty of Construction

Failure to submit all specified O & M manuals, spare parts listings, spare parts, special tools, inventories of installed property, and training video tapes in a timely manner will be considered as delaying substantial completion of the work. Commencement of warranty under the Contract Clause WARRANTY OF CONSTRUCTION will not occur until all these items are delivered and approved by the Contracting Officer, but not earlier than the date of final acceptance of the work by the Government. When the O & M Manuals with drafts are approved they will not constitute a reason for delaying the start of the warranty period.

1.3.2 Government Possession of Work

The Government may take possession of any completed or partially completed work as provided for under Contract Clause entitled "USE AND POSSESSION PRIOR TO COMPLETION." If the installed equipment and/or systems thereto, have not been accepted by the Government due to the Contractor's failure to submit the above specified items, the Contractor shall operate and maintain such plant or system at no additional cost to the Government until such time that the specified items have been received, approved and any subsequent testing, check-out and/or training has been completed.

1.4 PREPARATION AND SUBMISSION OF OPERATION AND MAINTENANCE MANUALS

This paragraph establishes general requirements for the preparation and submission of equipment operating, maintenance, and repair manuals as called for in the various sections of the specifications. Specific instruction(s) relating to a particular system or piece of equipment shall be incorporated into the manuals in accordance with the applicable technical specification.

1.4.1 General Requirements

(AM#2) Furnish operations and maintenance manuals on CD-ROM disk along with a single hard copy. Documents on the CD-ROM disk shall be in portable document format (.pdf); all printed and graphic documents, drawings, and illustrations shall be legible. Hard copy requirements are specified below.

1.4.1.1 Hard Cover Binders

The manuals shall be permanently bound and have a hard cover. The following identification shall be inscribed on the cover: the words "EQUIPMENT OPERATING, MAINTENANCE, AND REPAIR MANUAL:" and the name, building number, location, and indication of utility or systems covered. Manuals shall be approximately 8-1/2 by 11 inches with large sheets folded in and capable of being easily pulled out for reference. All manuals for a single facility must be similar in appearance.

1.4.1.2 Warning Page

A warning page shall be provided to warn of potential dangers (if they exist), such as high voltage, toxic chemicals, flammable liquids, explosive materials, carcinogens, or high pressures. The warning page shall be placed inside the front cover, in front of the title page.

1.4.1.3 Title Page

The title page shall show the name of the preparing firm (designer or contractor) and the date of publication.

1.4.1.4 Table of Contents

Provide in accordance with standard commercial practice.

1.4.2 Equipment Operating, Maintenance, and Repair Manuals

1.4.2.1 General

Separate manuals shall be provided for each utility system as defined hereinafter. Manuals shall be provided in the number of copies specified in the applicable technical section. Manuals shall include, in separate sections, the following information for each item of equipment:

a. Performance sheets and graphs showing capacity data, efficiencies, electrical characteristics, pressure drops, and flow rates. Marked-up

catalogs or catalog pages do not satisfy this requirement. Performance information shall be presented as concisely as possible and contain only data pertaining to equipment actually installed.

b. Catalog cuts showing application information.

c. Installation information showing minimum acceptable requirements.

d. Operation and maintenance requirements. Include adequate illustrative material to identify and locate operating controls, indicating devices and locations of areas or items requiring maintenance.

(1) Describe, in detail, starting and stopping procedures for components, adjustments required to obtain optimum equipment performance, and corrective actions for malfunctions.

(2) Maintenance instructions describing the nature and frequency of routine maintenance and procedures to be followed. Indicate any special tools, materials, and test equipment that may be required.

e. Repair information including diagrams and schematics, guidance for diagnosing problems, and detailed instructions for making repairs. Provide troubleshooting information that includes a statement of the indication or symptom of trouble and the sequential instructions necessary. Include test hookups to determine the cause, special tools and test equipment, and methods for returning the equipment to operating conditions. Information may be in chart form or in tabular format with appropriate headings.

f. Parts lists and names and addresses of closest parts supply agencies.

g. Names and addresses of local manufacturers representatives.

1.4.2.2 Exterior Electrical Systems

Information shall be provided on the following equipment: Power transformers, relays, reclosers, breakers, and capacitor bank controls.

1.4.2.3 Cathodic Protection Systems

Information shall be provided on the following material and equipment: Rectifiers, meters, anodes, anode backfill, anode lead wire, insulation material and wire size, automatic controls (if any), rheostats, switches, fuses and circuit breakers, type and size of rectifying elements, type of oil in oil-immersed rectifiers, and rating of shunts.

1.4.2.4 Miscellaneous Systems

Information shall be provided on the following: Communication and ADP systems, security and intrusion alarm, elevators, material handling, active solar, photovoltaic, and other similar type special systems not otherwise specified.

1.5 RECORD DRAWINGS

Record drawings shall be a record of the construction as installed and completed by the Contractor. They are a record of all deviations, modifications, or changes from contract set of drawings, however minor, which were incorporated in the work. They include all the information shown on the contract set of drawings, any Contractor-original drawings, all additional work not appearing on the contract drawings, and all changes which are made after final inspection of the contract work.

1.5.1 Contractor-Original Record Drawings

Contractor-original record drawings are those drawings drawn by the Contractor to further explain the Contract documents such as subcontractor submittals for fire protection/detection, communication, and other systems, and approved Contractor's solutions to problems. Submit these drawings as full-size reproducible sheets and CADD files. CADD files shall conform to the Working CADD file requirements specified in paragraph "Final Record Drawings."

1.5.2 Preliminary Record Drawings

The Contractor shall mark up both a reproducible set and a set of prints to show as-built conditions. These two sets, hereafter called preliminary record drawings, or singly, reproducibles or prints, shall be kept current and available on the jobsite at all times, except as noted below. For drawings contained within the Specifications, the Contractor shall mark up copies of these drawings to show as-built conditions; these copies will be considered the preliminary record drawings and shall be kept current and available on the jobsite at all times, except as noted below. A member of the Contractor's Quality Control Organization shall be assigned responsibility for the maintenance and currency of the preliminary record drawings. This assignment and any reassignment of duties concerning the maintenance of the record drawings shall be promptly reported to the Contracting Officer's representative for approval. All changes from the contract drawings which are made in the work or additional information which might be uncovered in the course of construction, including uncharted utilities, shall be accurately and neatly recorded as they occur by means of details and notes. All changes and/or required additions to the preliminary record drawings shall be clearly identified in a contrasting color and which is compatible with reproduction of the preliminary record drawings. Preliminary record drawings shall be updated by Friday of each week. During periods when the reproducibles are being copied and are therefore not available at the jobsite, the Contractor shall continue posting all required data to the prints. The Contractor shall minimize the time that the reproducibles are away from the jobsite and shall update them with all as-built data immediately upon their return. The preliminary record drawings will be jointly inspected for accuracy and completeness by the Contracting Officer's representative and the assigned representative of the Contractor's Quality Control Organization prior to submission of each monthly pay estimate. See paragraph, "Withholding for Preliminary Record Drawings." The record drawings shall show the following information, but not be limited thereto:

a. The location and description of utility lines or other installation

of any kind or description known to or found to exist within the construction area. The location of exterior utilities includes actual measured horizontal distances from utilities to permanent facilities/ features. These measurements shall be within an accuracy range of 6 inches and shall be shown at sufficient points to permit easy location of utilities for future maintenance purposes. Measurements shall be shown for all change of direction points and all surface or underground components such as valves, manholes, drop inlets, cleanouts, meter, etc. The general depth range of each underground utility line shall be shown (i.e., 3 to 4 feet in depth). The description of exterior utilities includes the actual quantity, size, and material of utility lines.

b. The location and size of all uncharted existing utilities encountered.

c. The location and dimensions of any changes within the building or structure.

d. Correct grade or alinement of roads, structures or utilities if any changes were made from contract drawings.

e. Correct elevations if changes were made in site grading.

f. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

g. The topography and grades of all drainage installed or affected as a part of the project construction.

h. Options

Where contract drawings or specifications allow options, only the option selected for construction shall be shown on the record drawings.

1.5.2.1 Blue Line or Black Line Prints

Blue line or black line prints shall be full size. All blue or black line prints shall exhibit good readable print with clear, sharp, dark lines, and shall not be smeared, faded, double imaged, or have torn or ragged edges.

1.5.2.2 Prefinal Inspection For Each Item of Work

As part of the prefinal inspection for each item of work, the preliminary record drawings will be reviewed. They shall comply with this specification prior to scheduling the final inspection, and/or prior to substantial completion of the item of work.

1.5.2.3 Preliminary Record Drawing Final Submittal

Prior to scheduling the final acceptance inspection of the last or only bid schedule item of work, the preliminary record drawings shall be completed

and delivered to the Contracting Officer's Representative for review and approval. If upon review, the drawings are found to contain errors and/or omissions, they will be returned to the Contractor for corrections. Failure of the Contractor to make timely delivery of the preliminary record drawings on any or all items of work will be cause for the Government to delay substantial completion and to assess liquidated damages in accordance with the terms and conditions of the contract.

1.5.2.4 Withholding for Preliminary Record Drawings

Failure by the Contractor to maintain current and satisfactory preliminary record drawings in accordance with these requirements will result in withholding from progress payments 10 percent of the progress payment amount until such time as the record drawings are brought into compliance. This withheld amount will be indicated on monthly payment estimates until the Contractor has fulfilled these contract requirements.

1.5.2.5 Final Inspection

For each interim item of work, furnish a copy of the preliminary record drawings for that item, which the Contractor has reproduced from the approved preliminary record drawing reproducibles, to the Contracting Officer's representative at the time of final inspection for that item. At the time of final inspection on the last or only item of work, the Contractor shall deliver a copy of the complete set of the approved preliminary record drawings to the Contracting Officer's Representative.

1.5.3 Final Record Drawings

Upon approval of the preliminary record drawings, the Contracting Officer will return the approved preliminary record drawing prints back to the Contractor. The Contractor will then modify the CADD files as may be necessary to correctly show all the features of the project as it was constructed by bringing the contract set into agreement with the preliminary record drawings, including adding additional drawings and CADD files as may be necessary. The Contractor shall furnish the as-built drawings in the same file format as the Working CADD files. The Working CADD files will be furnished to the Contractor. The Working CADD files are in Bentley Systems MicroStation format. These CADD files are part of the permanent records of this project and the Contractor shall be responsible for the protection and safety thereof until returned to the Contracting Officer. Drawings, tracings, or CADD files damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at the Contractor's expense. CADD files will be audited by the Contracting Officer and for accuracy and conformance to the above specified drafting and CADD standards.

1.5.3.1 Drafting

Only personnel proficient in the preparation of engineering drawings and CADD shall be employed to modify the original contract drawings, prepare additional new drawings, and modify the CADD files. All modifications and new drawings shall conform to applicable requirements specified in the paragraph "CADD Standards." The Contractor shall ensure that all delivered

CADD digital files and data (e.g., sheet files, model files, cell/block libraries) are compatible with the Government's target CADD system and operating system, and adhere to the standards and requirements specified. The term "compatible" means that data is in native digital format i.e., .dgn (MicroStation) or .dwg (AutoCAD). It is the responsibility of the Contractor to ensure this level of compatibility.

1.5.3.2 CADD Standards

CADD drawings shall be prepared in accordance with the applicable general and discipline-specific provisions for drawing formats, level/layer assignments, line colors, line weights, and line types of the TSC-01 (Tri-Service A/E/C Standards). and the COE-02 ("SWD Architectural and Engineering Instruction Manual (AEIM)), Chapter VIII, "Drawings."

CADD standards are located at the following Web sites:

http://tsc.wes.army.mil/html/standards/aec

Seed/prototype files, containing the Government's preset standard metric/English settings can be downloaded from the Internet at the following address:

http://www.swf.usace.army.mil/ed/stdshts.htm

Digital model files containing the Government's standard metric/English border sheets can be downloaded from the Internet at the following address:

http://www.swf.usace.army.mil/ed/stdshts.htm

The Contractor shall submit a written request for approval of any deviations from the Government's established CADD standards. Deviations will not be permitted unless prior written approval of such deviations has been received from the Government.

1.5.3.3 Final Revisions

When final revisions have been completed, place the words "REVISED RECORD DRAWING," in letters at least 3/16 inch high, and the date of completion in the revision block above the latest existing revision notation on each drawing CADD file.

1.5.3.4 Border Sheets

The border sheet to be used for any new record drawings shall be the same as used on the original drawings.

1.5.3.5 Copies of the Final Record Drawings

Blue line or black line prints shall be full size. All blue or black line prints shall exhibit good readable print with clear, sharp, dark lines, and shall not be smeared, faded, double imaged, or have torn or ragged edges.

1.5.3.6 Submittal Requirements

The Contractor shall submit to the Contracting Officer the final record drawings, consisting of one set of full size blue line or black line prints, one full size vellum reproducible set, and two sets of corrected CADD files on CD-ROM disks; verification that the CADD files have been loaded and work on the designated computer systems and are error- and virus-free; the approved preliminary blue lines; aperture cards, and two sets of diazo copies of the 35mm aperture cards;]and all required reproduced items. All paper prints, reproducible drawings, and CADD files will become the property of the Government.

1.5.4 Post-Record Drawing Work

In event the Contractor accomplishes additional work which changes the as-built conditions of the facility after submission of the record drawings, the Contractor shall furnish revised and/or additional drawings (hard copy and CADD files), as required to depict as-built conditions. The requirements for these additional drawings, including CADD files, will be the same as for the record drawings included in the original submission.

1.5.5 Payment for Final Record Drawings

The amount listed for Final Record Drawings in the Bidding Schedule will be paid to the Contractor upon the Contracting Officer's acceptance of the completed record drawings.

1.6 ADDITIONAL WARRANTY REQUIREMENTS

The warranty requirements specified in this paragraph are in addition to those specified in the Contract Clause WARRANTY OF CONSTRUCTION in Section 00700 CONTRACT CLAUSES.

1.6.1 Performance Bond

It is understood that the Contractor's Performance Bond will remain effective throughout the life of all warranties and warranty extensions. This paragraph is applicable to the Contractor's Warranty of Construction only and does not apply to manufacturers' warranties on equipment, roofing, and other products.

(a) In the event the Contractor or the Contractor's designated representative fails to commence and diligently pursue any work required under the Warranty of Construction Paragraph within a reasonable time after receipt of written notification pursuant to the requirements thereof, the Contracting Officer shall have a right to demand that said work be performed under the Performance Bond by making written notice on the surety. If the surety fails or refuses to perform the obligation it assumed under the Performance Bond, the Contracting Officer shall have the work performed by others, and after completion of the work, shall make demand for reimbursement of any or all expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

(b) Warranty repair work which arises to threaten the health or safety

of personnel, the physical safety of property or equipment, or which impairs operations, habitability of living spaces, etc., will be handled by the Contractor on an immediate basis as directed verbally by the Contracting Officer or the Contracting Officer's authorized representative. Written verification will follow verbal instructions. Failure of the Contractor to respond as verbally directed will be cause for the Contracting Officer or the Contracting Officer's authorized representative to have the warranty repair work performed by others and to proceed against the Contractor as outlined in the paragraph (a) above.

1.6.2 Pre-Warranty Conference

Prior to contract completion and at a time designated by the Contracting Officer or Contracting Officer's authorized representative, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of Contract Clause WARRANTY OF CONSTRUCTION. Communication procedures for Contractor notification of warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer or Contracting Officer's authorized representative for the execution of the construction warranty shall be established/reviewed at this meeting.

In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor will furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue warranty work action on behalf of the Contractor. This single point of contact will be located within the local service area of the warrantied construction, will be continuously available, and will be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of Contractor's responsibilities in connection with Contract Clause WARRANTY OF CONSTRUCTION.

1.6.3 Equipment Warranty Identification Tags

The Contractor shall provide warranty identification tags on all equipment installed under this contract. Tags and installation shall be in accordance with the requirements of Paragraph: EQUIPMENT WARRANTY IDENTIFICATION TAGS.

1.7 EQUIPMENT WARRANTY IDENTIFICATION TAGS

1.7.1 General Requirements

The Contractor shall provide warranty identification tags on all Contractor and Government furnished equipment which he has installed.

1.7.1.1 Tag Description and Installation

The tags shall be similar in format and size to the exhibits provided by this specification, they shall be suitable for interior and exterior locations, resistant to solvents, abrasion, and to fading caused by sunlight, precipitation, etc. These tags shall have a permanent

pressure-sensitive adhesive back, and they shall be installed in a position that is easily (or most easily) noticeable. Contractor furnished equipment that has differing warranties on its components will have each component tagged.

1.7.1.2 Sample Tags

Sample tags shall be submitted to the Contracting Officer's Authorized Representative for review and approval. These tags shall be filled out representative of how the Contractor will complete all other tags.

1.7.1.3 Tags for Warranted Equipment

The tag for this equipment shall be similar to the following. Exact format and size will be as approved by the Contracting Officer's Authorized Representative. The Contractor warranty expires (warranty expiration date) and the final manufacturer's warranty expiration dates will be determined as specified by the Paragraph "WARRANTY OF CONSTRUCTION."

EQUIPMENT WARRANTY CONTRACTOR FURNISHED EQUIPMENT
MFG_____ MODEL NO._____
SERIAL NO._____
CONTRACT NO._____
CONTRACTOR NAME_____
CONTRACTOR WARRANTY EXPIRES_____
MFG WARRANTY(IES) EXPIRE_____

1.7.1.4 Duplicate Information

If the manufacturer's name (MFG), model number and serial number are on the manufacturer's equipment data plate and this data plate is easily found and fully legible, this information need not be duplicated on the equipment warranty tag.

1.7.2 Execution

The Contractor will complete the required information on each tag and install these tags on the equipment by the time of and as a condition of final acceptance of the equipment. The Contractor will schedule this activity in the Contractor progress reporting system. The final acceptance inspection is scheduled based upon notice from the Contractor, thus if the Contractor is at fault in this inspection being delayed, the Contractor will, at the Contractor's own expense, update the in-service and warranty expiration dates on these tags.

1.7.3 Payment

The work outlined above is a subsidiary portion of the contract work, and has a value to the Government approximating 5% of the value of the Contractor furnished equipment. The Contractor will assign up to that amount, as approved by the Contracting Officer's Authorized Representative.

1.7.4 Equipment Warranty Tag Replacement

Under the terms of this contract, the Contractor's warranty with respect to work repaired or replaced shall run for one year from the date of repair or replacement. Such activity shall include an updated warranty identification tag on the repaired or replaced equipment. The tag shall be furnished and installed by the Contractor, and shall be identical to the original tag, except that the Contractor's warranty expiration date will be one year from the date of acceptance of the repair or replacement.

1.8 INVENTORY OF CONTRACTOR FURNISHED AND INSTALLED EQUIPMENT

A list of equipment or units of equipment that require electrical power or fuel, or may require removal or replacement such as AHUs, fans, air conditioners, compressors, condensers, boiler, thermal exchangers, pumps, cooling towers, tanks, fire hydrants, sinks, water closets, lavatories, urinals, shower stalls, and any other large plumbing fixtures, light fixtures, etc., shall be made and kept up to date as installed. The list shall be reviewed periodically by the Government to insure completeness and accuracy. Partial payment will be withheld for equipment not incorporated in the list. List shall include on each item as applicable: Description, Manufacturer, Model or Catalog No., Serial No., Input (power, voltage, BTU, etc.), Output (power, voltage, BTU, tons, etc.), Size or Capacity (tanks), and net inventory costs; any other data necessary to describe item and shall list all warrantors and warranty periods for each item of equipment. Final list shall be turned over to the Authorized Representative of the Contracting Officer at the time of the Contractor's quality control completion inspection.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

-- End of Section --

SECTION 02760

FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS
03/97
AMENDMENT 0002

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in this text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 509	(1994) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D 789	(1994) Determination of Relative Viscosity, Melting Point, and Moisture Content of Polyamide (PA)
(Am#2) ASTM D 3405	(1994) Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements
ASTM D 5893	(1996) Cold Applied, Single Component Chemically Curing Silicon Joint Sealant for Portland Cement Concrete Pavement

CORPS OF ENGINEERS (COE)

COE CRD-C 525	(1989) Corps of Engineers Test Method for Evaluation of Hot-Applied Joint Sealants for Bubbling Due to Heating

1.2 Not used.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Instructions

Manufacturer's Recommendations; GA.

Where installation procedures, or any part thereof, are required to be in

accordance with the manufacturer's recommendations, printed copies of these recommendations, 60 days prior to use on the project. Installation of the material will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

SD-07 Schedules

Construction Equipment List; FIO.

List of proposed equipment to be used in performance of construction work including descriptive data, 30 days prior to use on the project.

SD-14 Samples

Materials; GA.

Samples of the materials (sealant, primer if required, and backup material), in sufficient quantity for testing and approval 60 days prior to the beginning of work. No material will be allowed to be used until it has been approved.

1.4 Not used.

1.5 TEST REQUIREMENTS

The joint sealant and backup or separating material shall be tested for conformance with the referenced applicable material specification. Testing of the materials shall be performed in an approved independent laboratory and certified copies of the test reports shall be submitted and approved 14 days prior to the use of the materials at the job site. Samples will be retained by the Government for possible future testing should the materials appear defective during or after application. Conformance with the requirements of the laboratory tests specified will not constitute final acceptance of the materials. Final acceptance will be based on the performance of the in-place materials.

1.6 EQUIPMENT

Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and shall be maintained in satisfactory condition at all times.

1.6.1 Joint Cleaning Equipment

1.6.1.1 Tractor-Mounted Routing Tool

The routing tool used for removing old sealant from the joints shall be of such shape and dimensions and so mounted on the tractor that it will not damage the sides of the joints. The tool shall be designed so that it can be adjusted to remove the old material to varying depths as required. The use of V-shaped tools or rotary impact routing devices will not be permitted. Hand-operated spindle routing devices may be used to clean and enlarge random cracks.

1.6.1.2 Concrete Saw

A self-propelled power saw with water-cooled diamond or abrasive saw blades will be provided for cutting joints to the depths and widths specified or for refacing joints or cleaning sawed joints where sandblasting does not provide a clean joint.

1.6.1.3 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hose, and long-wearing venturi-type nozzle of proper size, shape and opening. The maximum nozzle opening should not exceed 6.4 mm (1/4 inch). The air compressor shall be portable and shall be capable of furnishing not less than 71 liters per second (150 cubic feet per minute) and maintaining a line pressure of not less than 621 kPa (90 psi) at the nozzle while in use. Compressor capability under job conditions must be demonstrated before approval. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1 inch above the pavement surface. The height, angle of inclination and the size of the nozzle shall be adjusted as necessary to secure satisfactory results.

1.6.1.4 Waterblasting Equipment

Waterblasting equipment shall include a trailer-mounted water tank, pumps, high-pressure hose, wand with safety release cutoff control, nozzle, and auxiliary water resupply equipment. The water tank and auxiliary resupply equipment shall be of sufficient capacity to permit continuous operations. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 1 inch above the pavement surface. The height, angle of inclination and the size of the nozzle shall be adjustable as necessary to obtain satisfactory results. A pressure gauge mounted at the pump shall show at all times the pressure in pounds per square inch at which the equipment is operating.

1.6.1.5 Hand Tools

Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces.

1.6.2 Sealing Equipment

1.6.2.1 Hot-Poured Sealing Equipment

(Am#2)
The unit applicators used for heating and installing ASTM D 3405 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

1.6.2.2 Not used.

1.6.2.3 Not used.

1.6.2.4 Cold-Applied, Single-Component Sealing Equipment

The equipment for installing ASTM D 5893 single component joint sealants shall consist of an extrusion pump, air compressor, following plate, hoses, and nozzle for transferring the sealant from the storage container into the joint opening. The dimension of the nozzle shall be such that the tip of the nozzle will extend into the joint to allow sealing from the bottom of the joint to the top. The initially approved equipment shall be maintained in good working condition, serviced in accordance with the supplier's instructions, and shall not be altered in any way without obtaining prior approval. Small hand-held air-powered equipment (i.e., caulking guns) may be used for small applications.

1.7 TRIAL JOINT SEALANT INSTALLATION

Prior to the cleaning and sealing of the joints for the entire project, a test section of at least 60 m long shall be prepared using the specified materials and approved equipment, so as to demonstrate the proposed joint preparation and sealing of all types of joints in the project. Following the completion of the test section and before any other joint is sealed, the test section shall be inspected to determine that the materials and installation meet the requirements specified. If it is determined that the materials or installation do not meet the requirements, the materials shall be removed, and the joints shall be recleaned and resealed at no cost to the Government. When the test section meets the requirements, it may be incorporated into the permanent work and paid for at the contract unit price per linear foot for sealing items scheduled. All other joints shall be prepared and sealed in the manner approved for sealing the test section.

1.8 DELIVERY AND STORAGE

Materials delivered to the job site shall be inspected for defects, unloaded, and stored with a minimum of handling to avoid damage. Storage facilities shall be provided by the Contractor at the job site for maintaining materials at the temperatures and conditions recommended by the manufacturer.

1.9 ENVIRONMENTAL CONDITIONS

The ambient air temperature and the pavement temperature within the joint wall shall be a minimum of 10 degrees C and rising at the time of application of the materials. Sealant shall not be applied if moisture is observed in the joint.

PART 2 PRODUCTS

2.1 SEALANTS

Materials for sealing cracks in the various paved areas indicated on the

drawings shall be as follows:

Area	Sealing Material
All areas	(Am#2) ASTM D 3405 and COE CRD-C 525

2.2 PRIMERS

Primers, when their use is recommended by the manufacturer of the sealant, shall be as recommended by the manufacturer of the sealant.

2.3 BACKUP MATERIALS

The backup material shall be a compressible, nonshrinking, nonstaining, nonabsorbing material and shall be nonreactive with the joint sealant. The material shall have a melting point at least 3 degrees C greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The material shall have a water absorption of not more than 5 percent of the sample weight when tested in accordance with ASTM C 509. The backup material shall be 25 plus or minus 5 percent larger in diameter than the nominal width of the crack.

2.4 BOND BREAKING TAPES

The bond breaking tape or separating material shall be a flexible, nonshrinkable, nonabsorbing, nonstaining, and nonreacting adhesive-backed tape. The material shall have a melting point at least 3 degrees C greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The bond breaker tape shall be approximately 3 mm wider than the nominal width of the joint and shall not bond to the joint sealant.

PART 3 EXECUTION

3.1 PREPARATION OF JOINTS

Immediately before the installation of the sealant, the joints shall be thoroughly cleaned to remove all laitance, curing compound, filler, protrusions of hardened concrete, and old sealant from the sides and upper edges of the joint space to be sealed.

3.1.1 Not used.

3.1.2 Sawing

3.1.2.1 Refacing of Joints

Refacing or facing of joints shall be accomplished using a concrete saw as specified in paragraph EQUIPMENT to remove all residual old sealant and a minimum of concrete from the joint face to provide exposure of newly

cleaned concrete, and, if required, to enlarge the joint opening to the width and depth shown on the drawings and to saw through sawed and filler-type joints to loosen and remove material until the joint is clean and open to the full specified width and depth. The blade shall be stiffened with a sufficient number of suitable dummy (used) blades or washers. Immediately following the sawing operation, the joint opening shall be thoroughly cleaned using a water jet to remove all saw cuttings and debris.

3.1.2.2 Refacing of Random Cracks

Sawing of the cracks shall be accomplished using a power-driven concrete saw as specified in paragraph EQUIPMENT. The saw blade shall be 152 mm (6 inch) or less in diameter to enable the saw to follow the trace of the crack. The blade shall be stiffened as necessary with suitable dummy (or used) blades or washers. Immediately following the sawing operation, the crack opening shall be thoroughly cleaned using a water jet to remove all saw cuttings and debris.

3.1.3 Sandblasting or Waterblasting

The newly exposed concrete joint faces and the pavement surfaces extending a minimum of 13 mm from the joint edges shall be sandblastedor waterblasted clean. A multiple-pass technique shall be used until the surfaces are free of dust, dirt, curing compound, filler, old sealant residue, or any foreign debris that might prevent the bonding of the sealant to the concrete. After final cleaning and immediately prior to sealing, the joints shall be blown out with compressed air and left completely free of debris and water.

3.1.4 Back-Up Material

When the joint opening is of a greater depth than indicated for the sealant depth, the lower portion of the joint opening shall be plugged or sealed off using a back-up material to prevent the entrance of the sealant below the specified depth. Care shall be taken to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

3.1.5 Bond Breaking Tape

Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, a bond breaker separating tape will be inserted to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. The tape shall be securely bonded to the bottom of the joint opening so it will not float up into the new sealant.

3.1.6 Rate of Progress of Joint Preparation

The stages of joint preparation which include sandblasting, air pressure cleaning and placing of the back-up material shall be limited to only that lineal footage that can be sealed during the same day.

3.2 PREPARATION OF SEALANT

3.2.1 Hot-Poured Sealants

(Am#2)
Sealants conforming to ASTM D 3405 shall not be heated in excess of the safe heating temperature recommended by the manufacturer as shown on the sealant containers. Sealant that has been overheated or subjected to application temperatures for over 4 hours or that has remained in the applicator at the end of the day's operation shall be withdrawn and wasted.

3.2.2 Not used.

3.2.3 Not used.

3.2.4 Single-Component, Cold-Applied Sealants

The ASTM D 5893 sealant and containers shall be inspected prior to use. Any materials that contain water, hard caking of any separated constituents, nonreversible jell, or materials that are otherwise unsatisfactory shall be rejected. Settlement of constituents in a soft mass that can be readily and uniformly remixed in the field with simple tools will not be cause for rejection.

3.3 INSTALLATION OF SEALANT

3.3.1 Time of Application

Joints shall be sealed immediately following final cleaning of the joint walls and following the placement of the separating or backup material. Open joints that cannot be sealed under the conditions specified, or when rain interrupts sealing operations shall be recleaned and allowed to dry prior to installing the sealant.

3.3.2 Sealing Joints

Immediately preceding, but not more than 15 m ahead of the joint sealing operations, a final cleaning with compressed air shall be performed. The joints shall be filled from the bottom up to 6 mm plus or minus 1.5 mm below the pavement surface. Excess or spilled sealant shall be removed from the pavement by approved methods and shall be discarded. The sealant shall be installed in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, it shall be applied evenly to the joint faces in accordance with the manufacturer's instructions. Joints shall be checked frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

3.4 INSPECTION

3.4.1 Joint Cleaning

Joints shall be inspected during the cleaning process to correct improper equipment and cleaning techniques that damage the concrete pavement in any

manner. Cleaned joints shall be approved prior to installation of the separating or back-up material and joint sealant.

3.4.2 Joint Sealant Application Equipment

The application equipment shall be inspected to ensure conformance to temperature requirements, proper proportioning and mixing (if two-component sealant) and proper installation. Evidences of bubbling, improper installation, failure to cure or set shall be cause to suspend operations until causes of the deficiencies are determined and corrected.

3.4.3 Joint Sealant

The joint sealant shall be inspected for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified herein at no additional cost to the Government.

3.5 CLEAN-UP

Upon completion of the project, all unused materials shall be removed from the site and the pavement shall be left in a clean condition.

-- End of Section --

SECTION 16000

HIGHWAY-RAIL GRADE CROSSING WARNING SYSTEMS
7/00
AMENDMENT NO. 0002

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN RAILWAY ENGINEEERING AND MAINTENANCE-OF-WAY ASSOCIATION (AREMA)

AREMA Signal Manual	(2000) Signal Manual

FEDERAL HIGHWAY ADMINISTRATION (FHWA)

FHWA SA-89-006	(1988) Manual on Uniform Traffic Control Devices for Streets and Highways

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(1999) National Electrical Code

CODE OF FEDERAL REGULATIONS (CFR)

49 CFR 212, 233 & 234	Grade Crossing Signal Safety

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI O5.1	(1992) Specifications and Dimensions for Wood Poles

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

UNDERWRITERS LABORATORIES (UL)

UL 6	(1997) Rigid Metal Conduit
UL 489	(1996; Rev thru Nov 1997) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 514A	(1996; Rev Jul 1998) Metallic Outlet Boxes
UL 651	(1995; Rev thru Oct 1998) Schedule 40 and 80 Rigid PVC Conduit

UL 854	(1996; Rev Apr 1998) Service-Entrance Cables
UL 1072	(1995; Rev Mar 1998) Medium-Voltage Power Cable

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

1.2 GENERAL REQUIREMENTS

The following provisions and conditions are the general requirements for the furnishing of materials and installation of the highway-rail grade crossing warning systems for this project. Applicable general references are AREMA Signal Manual, FHWA SA-89-006, NFPA 70 and Underwriters Laboratories Standards:

a. The Contractor shall perform the work in conformance with the standards of care and practice appropriate to the nature of the work.

b. The Contractor shall allow the Contracting Officer to view and inspect the work at any time.

c. The Contractor shall take any safety precautions that the Contracting Officer deems necessary. No equipment, unless being utilized to perform work on the railroad track, shall be located within 12 ft of the centerline of the nearest railroad track. Such equipment allowed within 12 ft of the centerline of the nearest railroad track shall be attended at all times.

d. In case of discrepancies between these specifications and any attached revisions and/or addenda and the above referenced specifications, these specifications shall govern.

e. It shall be the contractor's responsibility to provide a complete operating system in accordance with the plans and specifications.

f. All materials shall be new and shall be the product of a company regularly engaged in the manufacture of these products, and whose products have been successfully used in the commercial railroad industry for at least five (5) years. Remanufactured materials shall not be permitted. All materials and workmanship shall be guaranteed against defects in materials and workmanship for a period of at least one year from date of acceptance.

g. Manufacturers catalog data shall be furnished for the items identified.

h. The contractor is responsible for any loss or damage to materials prior to the date of final project acceptance.

i. The date of conditional acceptance will be the date of

activation. The Contracting Officer shall have the opportunity to be in attendance at the time of activation.

j. The date of final acceptance will be the final project acceptance date and the following:

· The system has operated satisfactorily with no major defects.
· The "As-Built" wiring diagrams have been received in the format(s) specified.
· The Contracting Officer has reviewed and inspected the installation to insure compliance with these specifications.

k. At the time the warning system in placed in-service, the contractor shall provide the following records of tests (Reference 49 CFR 212 & 234):

· 49CFR234.221 Lamp Voltage taken at lamp base.
· 49CFR234.223 Gate Arm
· 49CFR234.225 Activation of Warning System.
· 49CFR234.229 Shunting Sensitivity.
· 49CFR234.249 Grounds.
· 49CFR234.251 Standby Power System.
· 49CFR234.253 Flashing Light Units.
· 49CFR234.255 Gate Arm Lights and Light Cable.
· 49CFR234.257 Warning System Operation.
· 49CFR234.259 Warning Time.
· 49CFR234.261 Highway Traffic Signal Preemption (If so equipped).
· 49CFR234.263 Appropriate relay test for each relay installed in the warning system.
· 49CFR234.267 Insulation Resistance for all required wires and cables
· 49CFR234.269 Cut-Out Circuit (If so equipped).
· 49CFR234.271 Insulated Rail Joints, Bond Wires and Track Connections.

l. The contractor shall provide a minimum of eight (8) hours of training pertaining to the maintenance, inspection and testing requirements for highway-rail grade crossing warning systems as identified in 49CFR Parts 233 & 234. Training must be provided for basic familiarization of electronic equipment. A minimum notice of two (2) weeks will be provided to the Contracting Officer prior to the training session.

m. The contractor shall provide direct supervision of the project installation and cut-over, utilizing a supervisor with not less than three (3) years experience in railroad signal installation and maintenance.

1.3 MEASUREMENT AND PAYMENT

All measurement and payment will be based on completed work performed in accordance with the Contract Drawings and Specifications. No special pay

items are established for these items. This work shall be considered incidental to the project and included in the lump sum price.

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Data

Manufacturer's Catalog Data; GA, Crossing Lamp Controllers; GA, Vital LogicGates; GA, Vital Relay Driver; GA, Batteries; GA, Battery Charger/Rectifier; GA, LED Gate Lamps; GA, LED Light Units; GA, Junction Box, and Lighting Arrester; GA

Catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

SD-04 Drawings

As-Built Wiring Diagrams; GA, Final Wiring Drawings; GA

The as-built drawings shall be a record of the construction as installed. The drawings shall include the information shown on the contract drawings as well as deviations, modifications, and changes from the contract drawings, however minor. The as-built drawings shall be a full sized set of prints marked to reflect deviations, modifications, and changes. The as-built drawings shall be complete and show the location, size, dimensions, part identification, and other information. Additional sheets may be added. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor's quality control representative and by the Contracting Officer prior to the submission of each monthly pay estimate. Upon completion of the work, the Contractor shall provide three full sized sets of the marked prints to the Contracting Officer for approval. If upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for correction. The Contractor shall correct and return the as-built drawings to the Contracting Officer for approval within 10 calendar days from the time the drawings are returned to the Contractor.

SD-08 Statements

Records of Installation Supervisors Experience; FIO.

A record or resume of the Signal Installation Supervisor's prior experience including projects, employers references and telephone numbers for a minimum period of three (3) years shall be submitted 30 days prior to any signal installation work being performed.

SD-18 Records

Records of Tests; FIO.

Certified copies of test records documenting that the specified in service tests have been performed shall be submitted for each grade crossing warning system placed in service under this project.

SD-19 Operation and Maintenance Manuals

Equipment Manuals; FIO.

Six copies of operation and maintenance manuals shall be furnished within 7 calendar days following final completion and acceptance of the project, including assembly, installation, operation and maintenance instructions, spare parts data which provides supplier name, current cost, catalog order number, and a recommended list of spare parts to be stocked. Manuals shall also include data outlining detailed procedures for system startup and operation, and a troubleshooting guide which lists possible operational problems and corrective action to be taken. A brief description of all equipment, basic operating features, and routine maintenance requirements shall also be included. Documents shall be bound in a binder marked or identified on the spine and front cover. A table of contents page shall be included and marked with pertinent contract information and contents of the manual. Tabs shall be provided to separate different types of documents, such as catalog ordering information, drawings, instructions, and spare parts data. Index sheets shall be provided for each section of the manual when warranted by the quantity of documents included under separate tabs or dividers.

1.5 DELIVERY, STORAGE AND HANDLING

Devices and equipment shall be visually inspected by the Contractor when received and prior to acceptance from conveyance. Stored items shall be protected from the environment in accordance with the manufacturer's published instructions. Damaged items shall be replaced. Oil filled transformers and switches shall be stored in accordance with the manufacturer's requirements. Wood poles held in storage for more than 2 weeks shall be stored in accordance with ANSI O5.1. Handling of wood poles shall be in accordance with ANSI O5.1, except that pointed tools capable of producing indentations more than 1 inch in depth shall not be used. Metal poles shall be handled and stored in accordance with the manufacturer's instructions.

1.6 EXTRA MATERIALS

One additional spare fuse or fuse element for each furnished fuse or fuse element shall be delivered to the contracting officer when the electrical system is accepted. Two complete sets of all special tools required for maintenance shall be provided, complete with a suitable tool box. Special tools are those that only the manufacturer provides, for special purposes (to access compartments, or operate, adjust, or maintain special parts).

PART 2 PRODUCTS

2.1 2.1 METER SERVICE

The contractor shall furnish new meter service, two pole type QO disconnect rated 100 Amp minimum and associated conduit risers, entrance heads, grounding and installed in accordance with the standards of the Underwriters Laboratories (UL) or to be constructed or tested, or both, in accordance with the standards of the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA) and any applicable state and local requirements. The contractor shall contact the power company and arrange for 120/240 single phase service at the site. Minimum 25kVA transformer to be utilized at each site. The main circuit breaker shall be rated 60 amps. A lightning arrester shall be installed as a part of the service pole assembly.

2.2 BONDS

All rail joints within the approach limits shall be bonded with type S-5 plug bonds. All track wire connections shall be made to the web of the rail with 3/16" - #6 STR "chicken head" track connectors. The bondstrand shall be clamped to the base of the rail with a steel rail clamp. All switch bonding shall be double bonded with bare - 3/16" type S-8 multi-purpose bonds to the web of the rail. Transposition wire bonding shall utilize double 3/16" PVC insulated bondstrand. The bondstrand shall be secured to the rail with a steel rail clamp and stapled to the upper side (not top) of the tie. Adequate cribbing shall be performed to permit an unobstructed view on all transposition wires.

2.3 TRACK INSULATION

All track insulation at the approaches and within the limits of the circuits shall be installed as new. Existing insulation shall be replaced. This includes the following items:

- Rail joints
- Switch rods
- Switch gauge plates
- Gauge rods

Bolted rail joints shall be installed in jointed track. Four or six bolt joints shall be used to match existing non-insulated joints. I-Bond type welded joints shall be utilized where welded rail is in place. Track insulation will be furnished and installed by the signal contractor.

2.4 CONTROL EQUIPMENT

2.4.1 Train Detection

Train detection shall be provided by Constant Warning Time (CWT):

DC rail-wetting device shall be installed to overcome the effects of rust on the rail. CWT shall be single-track redundant systems. Multiple track systems shall not be utilized in any case.

If a relay or relays are installed in a bungalow or case, one test

wrench and one contact extractor shall be supplied for the location.

2.4.2 Monitoring

GCP3000 units shall include an 80214 CPU board and 80255 Echelon interface board.

Crossing monitoring shall be performed by a modular event recorder/analyzer capable of monitoring a minimum of 24 digital and 4 analog inputs. The basic configuration shall use a processor/display unit with 20k memory and a single digital/analog I/O. The processor/display unit shall have activity indicator LED's for monitoring input status, and a 16-character alphanumeric LED display. Additional I/O units shall be installed as necessary for each application. Each modular unit shall be capable of communicating via a two-wire network connection. Lamp monitoring shall be provided for each individual signal with a current monitor capable of mounting directly on the lamp terminal and interfacing with an analog input on the digital/analog I/O unit

The recorder data shall be capable of being downloaded to a notebook PC running Windows 98 via Hyperterm.

2.4.3 Signal Control

Signal control shall be provided by a minimum of two B1 relay mountable crossing lamp controllers. Each controller shall be configured to light one signal including main lights, side lights (if any installed) and gate lights. The bell shall be connected to the bell output driver. No controller shall be loaded to more than 15 amperes. If the load exceeds 15 amperes, additional controller units shall be installed.

Control inputs shall be routed through one or more, as necessary, B1 relay mountable vital logic gates. The VLG shall combine outputs from the control equipment to provide an "XR" source for the controller units. The VLG shall be set for a six second delay for gate release.

A Vital Relay Driver shall provide control of the hold clear circuit.

Signal power shall be provided by one or more sets of batteries. All lighting shall be DC. Lighting transformer(s), power off relay(s), etc. will not be accepted.

2.4.4 Batteries

A minimum of two sets of maintenance free batteries shall be supplied; one for equipment and one for signal operation. Each cell shall be 500ah for installations with two flashing lights or two flashing light/gate signals. Where flashing light/gate signals are used in combination with cantilever signals, or sidelights are required on mast signals, 710ah cells shall be utilized. Each battery array shall consist of a minimum of six cells connected in series. Seven cells shall be provided for signal battery where cable resistance limits the signal lamp voltage below 9.5 VDC. All battery connections shall be made by minimum size 6 AWG wire with Hypalon

insulation. A terminal block shall be provided above each set of batteries with test nuts to allow battery or charger power to be opened for test purposes. Temperature probes shall be attached to the battery and connected directly to the charger with cable provided by the manufacturer.

2.4.5 Battery Charger/Rectifier

A minimum of two battery charger/rectifier units shall be provided for equipment and signal power. A 12-volt/40 amp Charger shall provide the equipment power. The signal power shall be provided by one or more 12-volt/40-amp chargers based on the load required. Each charger shall be mounted on the appropriate shelf directly above the batteries to which it is connected. No charger shall be required to provide more that 75% of its rated current with signals operating (excluding gate power up and power down).

2.4.6 Control Equipment Housing

Control equipment shall be housed in a 6' X 6' (minimum size) aluminum instrument house. The house exterior walls and roof shall be left as unfinished .09" aluminum. The house floor shall be .125" aluminum panels finished with a rubber mat that covers the entire floor. The interior of the house shall be painted gloss white. Doors shall be provided on the front and back of the house. Doors shall be removable only by removal of the middle hinge which is reversed from the top and bottom hinges. A full height terminal board shall be provided at the back of the house in front of the back door which includes a relay rack at the very top of the terminal board. The house shall be furnished pre-wired including minimum 100 amp Type QO panel with breakers installed for the following:

- QO130 breaker for control equipment
- QO115 breaker for fluorescent lamps
- QO120 amp ground fault breaker for duplex receptacle

The circuit breaker box shall be mounted on the inside front of the house just to the left of the door (looking into the house). Illumination shall be provided by two fluorescent lamp fixtures, each of which shall include two 40 watt rapid start lamps enclosed in shatter-guard tubes. The fluorescent lamps shall be controlled by a standard lamp switch mounted just inside the door. Air intake shall be via two filtered intakes, one in each door. Each air intake shall be filtered by use of a standard furnace type air filter. The floor of the house shall be provided with a rubber mat for floor covering. A minimum of two shelves and three tag boards shall be provided on each of the sidewalls. Each shelf shall be supplied with a rubber mat. The house shall be equipped with two bi-directional indicators mounted on the exterior top of the fan shroud protected by a fabricated vandal resistant guard. These indicators shall provide an indication of equipment operation to approaching trains. The first indicator shall utilize a 4" diameter yellow lens on each face and shall be connected to one of the flasher circuits. The second indicator shall utilize 4" diameter clear or lunar lenses to indicate power on status. Each indicator shall utilize a standard 10 volt, 25 watt signal lamp and shall be provided with a lamp resistor for adjustment of the lamp voltage. The light shall be arranged yellow-white from the rail side out.

The following listed manufacturer's instrument houses or approved equal shall be used:

Manufacturer	Part Number
PTMW	P/N:10695
Safetran	P/N:12125
Harmon	P/N:11893

2.4.7 Mechanical

All control equipment shall be furnished mounted on shelves, wired and tested. Generally, the equipment shall be arranged with detection circuits and equipment charger/power supply on the right side shelves. The Vital Relay Driver and signal charger/power supply shall be on the left side shelves. The crossing lamp controller units, vital logic gate units, track wire termination/surge suppression panel, lamp resistors, field terminals, power distribution terminals, lightning arresters and traffic signal interconnect relay (if required) shall be installed on the terminal board at the back of the house. This terminal board shall include an integral relay rack at the top to house all plug-in relay bases. The equipment batteries shall be installed on the right side floor below the shelf (when viewed from the front door of the house). The signal batteries shall be installed on the left side floor below the shelf (when viewed from the front door of the house).

2.4.8 Signal Equipment

Each gate or flashing light signal assembly shall be provided as a complete unit consisting of the following items as necessary:

a. 5 in. split base complete with two 6 point terminal blocks and test nuts for all circuits.

b. 16 ft. aluminum mast (An 18 ft. mast shall be provided if required for installation of two sets of auxiliary lights) with welded ground wire pigtail.

c. Gate mechanism with the following items:
· Maintainer Test Pushbutton.
· Cast aluminum gate mounting arms.
· Fully adjustable weights.
· Gate arm-mounting bracket with buffer spring.
Aluminum base - fiberglass tip gate arm, length as application. Aluminum base section of gate arm should typically be 16' in length, minimum.
· Diamond Grade sheeting on front and back of gate arm.
· Three 4" diameter red LED gate lamps. Lamps to have cast metal lens ring and cast aluminum junction box. No plastic lights or boxes shall be permitted. Gate lamps to be secured to gate arm with stainless steel machine screws and locknuts.
Each gate mechanism power circuit shall utilize a type NON 30 fuse. Two extra type NON 30 fuses shall be furnished as spares

for each grade crossing installation upon completion of the project.

d. Flashing light assembly with the following items:
· 12 in. LED light units.
· 20 in. powder coated aluminum backgrounds.
· Powder coated aluminum visor.
· Sidelights mounted for indication to the right of center shall be mounted directly to the signal mast.
· Sidelights mounted for indication to the left of center shall be mounted on an extension arm bolted to the main mast.
· Front and rear single face RAILROAD CROSSING sign with Diamond Grade sheeting and bolt on mounting bracket. Band on sign brackets are not acceptable.
· Electronic bell.
· High wind bracket.
· All signal hardware to be stainless steel, brass or aluminum, except counterweights, which are to be, painted steel.
· One torque wrench shall be supplied to the Government for each crossing installation complete with all necessary sockets and tools to adjust horizontal and vertical torque on gates.

PART 3 EXECUTION

All construction shall be performed in accordance with all applicable local, state and federal codes. It is not the intent of these specifications and standards to detail requirements for each location or installation. Rather, a general set of requirements is defined to provide a minimum standard of quality. In all cases, the contractor shall schedule his work so as not to interfere with rail traffic operations. Construction shall consist of the following major items:

3.1 Installation of Instrument House

The instrument house shall be located in a site designated on the plans. The house shall be set utilizing the internal legs a minimum of 24 inches deep. The house shall be leveled by use of the adjusting bolts on the legs supplied as a part of the house. The house shall be finished by providing cover rock to a minimum 12" depth with an 18" border around the house and a minimum tapered slope to the house of 12".

3.2 Installation of Instrument Case

The instrument case shall be located at the site designated on the plans. The case shall be set utilizing two galvanized steel foundations with front and back steps a minimum of 24 inches deep. The case shall be leveled by adjusting fill prior to placing the foundations. The case shall be finished by providing cover rock to a minimum 12 inches depth with a minimum tapered slope to the case of 18 inches.

3.3 Grounding

The instrument house shall be grounded to four 5/8 inch diameters by 10 ft.

long copper ground rods. A case shall be grounded to two ground rods. Each rod shall be driven into the soil to a depth of 4" above finished grade. The house shall be connected to the ground rods with minimum #2 AWG solid copper conductor welded to the house. The ground wires shall be welded using Erico One-Shot connections to the ground rods. In addition, the ground rods shall be connected by a continuous loop of #2 AWG solid copper wire run from ground rod to ground rod. The ground loop shall be routed such that the ground wire between the rear legs of the house shall be looped into the house and connected to the ground bus bar. Each ground wire weld shall be visible for inspection purposes.

3.4 Underground Requirements

All wiring connections shall be made by in a conduit system. Conduit of the size and type indicated shall be installed as follows:

3.4.1 Service Conduit

Service conduit, minimum 2 inches diameters schedule 80 PVC minimum 24 inches deep from finished grade to top of conduit.

Exceptions:
· Minimum depth 48 inches if installed as part of crossing surface or 12 inches below deepest point of excavation, whichever is more.
· Minimum depth 48 inches below top of rail if conduit crosses under track.

3.4.2 Signal Conduit

Signal conduit, minimum 4 inch diameter schedule 80 PVC minimum 24 inch deep from finished grade to top of conduit.

Exceptions:
· Minimum depth 48 inches if installed as part of crossing surface or 12 inch below deepest point of excavation, whichever is more.
· Minimum depth 48 inches below top of rail if conduit crosses under track.

3.4.3 Track Wire Conduit

Track wire conduit, minimum 4 inch diameters schedule 80 PVC. Minimum depth 24 inch from finished grade to top of conduit.

Exceptions:
· Minimum depth 48 inches if installed as part of crossing surface or 12 inch below deepest point of excavation, whichever is more.
· Minimum depth 48 inches below top of rail if conduit crosses under track.

3.4.4 Miscellaneous Circuit Conduit

Miscellaneous circuit conduit, minimum 2 inches diameter or as identified on the plans, schedule 80 PVC 24 inches deep from finished grade to top of conduit.

Exceptions:
· Minimum depth 48 inches if installed as part of crossing surface or 12 inch below deepest point of excavation, whichever is more.
· Minimum depth 48 inches below top of rail if conduit crosses under track.

3.4.5 Pullbox

A pullbox shall be installed next to each signal foundation and at the non-signal end of the road bore. Pullboxes shall be polymortar with cover, minimum size 18" X 24" with a minimum depth of 12" unless otherwise noted on plan. Each pullbox shall be leveled to finished grade and shall rest on a minimum 12" deep crushed stone bed for drainage. Cable shall not be spliced at the pullbox. Pullboxes are to be utilized as a relief method for cable pulls.

3.5 Cable

Cable with stranded copper conductors shall be installed as follows in the size indicated:

3.5.1 Signal to Instrument House

10 ea #6 AWG and 7 ea #10 AWG if signal is within 125 ft. of house. If signal is between 125 ft. and 200 ft. from house, 5 additional #6 AWG conductors shall be installed. Signals located more that 200 ft. from the house require an additional instrument case with controls for the distant signal or signals. All signal cable shall be single conductor or composite stranded type XHHW.

3.5.2 Track Junction Box to Instrument House

Twisted pair, #6 AWG solid conductor.

3.5.3 Track to Track Junction Box

Single conductor stranded bond wire, 133 strand, .013 inch tinned cadmium bronze with .080 inch PVC.

3.5.4 Wire Terminations

All wiring shall be performed in a neat and professional manner. All stranded wire terminations shall be made with crimped ring type lugs rated for railroad application. Solid wire terminations shall be made by forming a ring with the wire. Crimp connections are forbidden on solid conductors. All crimp terminations shall be performed using a ratchet type crimping tool designed to hold the lug until a full close crimp cycle is completed. Each wire shall be tagged with a permanent label applied to each end of the wire stating the origin and destination of the wire or the function of the wire.

3.5.5 Signal Foundations

All buriable signal foundations shall be galvanized steel in a pyramid type configuration 60" in height. A total of eight nuts and eight washers shall be provided for leveling purposes on each foundation. Cantilever foundations shall be poured in place per the manufacturer's recommendations. A prefabricated leave in place foundation kit shall be utilized for all cantilever signals. A rodent guard plate shall be provided and installed with each foundation.

3.5.6 Track Bonding

All track bonding shall be attached by the plug bond process. The bonds shall be 3/16 inch - #6 STR "chicken head" track connectors and shall be installed per the manufacturer's instructions.

3.5.7 Track Wire Junction Box

A track wire junction box shall be installed at each point where connections are to be made between the rail and control equipment. The junction box shall be modified to include CGB (cord grip bushing) fittings as needed, one per track wire. The junction box shall be configured to mount directly on top of the 4 inch stub conduit. The junction box shall be located a minimum of 10 ft. from the center of the track and shall be slightly higher than grade to prevent entry of water.

3.6 Track Shunts

Track shunts of the proper type necessary for the application shall be furnished and installed. Unless otherwise specified, narrow band shunts shall be furnished at each location. Shunts shall be installed in a 8 inch diameter schedule 80 PVC pipe mounted vertically between the ties, centered between the rails, a minimum of 24 inches in depth. The shunt housing shall be equipped with a terminal block to permit disconnection of the shunt for maintenance purposes. A three terminal lightning arrester and a three position single post terminal block shall be mounted on the underside of the 8 inch PVC cap. A 10 inch x 5/8 inch copper ground rod shall be installed within the shunt housing for connection to the center leg of the arrester. The pipe shall be provided with a slip on cover and shall be secured in place by installation of a shunt marker plate lag screwed to the ties over the shunt. Connections to the rails shall be made with track connections (3/16 " - 6# str type connectors in the web of the rail. The shunt shall be installed with the wire leads down.

3.7 Retaining Walls

Where warning devices, bungalows, electric service or other items are located on a slope or low area, or in an area where drainage will erode the earth surrounding such a device, a retaining wall shall be constructed. Fill material shall then be provided to obtain a relatively level surface around the device. The wall shall be constructed of 80 lb. (minimum) bags of "Sakrete" cement or equivalent. The bags shall be laid horizontally in an interlocking fashion to assure rigidity. Bags shall be pinned with 3/8 inch re-bar every four horizontal bags for a thickness of three bags minimum. The wall shall be laid to provide the taper and contour necessary

to complete the fill.

3.8 Guard Rails

Guardrails shall be provided where indicated on the plans. Guardrail shall be 7 ft. diameter, hot galvanized steel "tunnel liner" with galvanized steel I beam legs. Galvanized hardware shall be furnished for assembly. All legs shall be pushed into the ground and assembled to the ring to make a complete and level assembly.

3.9 Identification

Each crossing warning system bungalow installed adjacent to a roadway shall be provided with an identification decal. The decal shall consist of 2" characters on white engineer grade or equivalent reflective sheeting. The decal shall face the roadway and shall include the railroad name, telephone number to be supplied by the contracting officer (including area code) to report trouble, the roadway name and DOT number. Each signal mast shall have a vertical decal installed on the mast facing the roadway (not oncoming traffic). The decal shall consist of 2" characters on white engineer grade or equivalent reflective sheeting. The decal shall indicate the DOT number.

3.10 Documentation

The contractor shall supply within 30 days of conditional acceptance, final wiring drawings of all equipment installed. A minimum of four sets of prints in 11 inch X 17 inch format shall be supplied. Prints shall also be provided on a CD-ROM disk suitable for use in a Microstation environment (.DGN format) for future revisions that may become necessary. Generic or typical drawings are unacceptable. Every sheet shall be identified by crossing DOT, Railroad Station plus milepost and sheet number. One complete set of equipment manuals shall be provided for each piece of electronic equipment and left in the bungalow. The manual shall be the manufacturers product manual with specifications, installation, operation and maintenance information.

3.11 Meter Service

The contractor shall be responsible for the installation of power from the meter disconnect to the power distribution panel inside of the bungalow. The meter service shall be installed by the Fort Polk electrical division as per section 2.1.

-- End of Section --